Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

Nor is there anything surprising in this, if truth is nothing but a particular kind of satisfactory experience. The principle of contradiction has no meaning and can no longer hold if truth be altogether within one's experience.

The usefulness of an hypothesis is indeed an excellent test of its truth. This is a practical method for the verification of an idea on which pragmatism has done well to insist. But to identify the truth of a thought with the process of its own verification can hardly lead to anything but intellectual confusion.

JAMES BISSETT PRATT.

WILLIAMS COLLEGE.

ON THE FUNCTION OF VISUAL IMAGES

IN spite of the frequent references to individual differences in the relative development of different sorts of imagery and in the vividness and fidelity of imagery of any one sort, little attention has been paid to discovering the significance of these differences. For example, speculations assuming a positive relation between (1) the relative facility and permanence of impressions through any sense and (2) the relative number, vividness and fidelity of the images corresponding to that sense have been allowed to run riot, though there is not, so far as I am aware, any proof that such a relation exists, and though there certainly is no proof that it is at all close.

Again, it is common not only for writers on pedagogy or on mental diseases, but even for expert psychologists, to talk as if responses of thought and action were based chiefly on and directed chiefly by data present in the form of images,—as if, for instance, the patient could not say *cat* because he had 'lost' the appropriate motor image; as if the singer knew his note to be false by comparing it with an auditory image of the proper pitch; as if the equipment of a student of anatomy were in large measure an inner panorama of bodily organs. Yet no one has demonstrated that the possession of many and vivid and faithful motor images makes any great difference to speech, or that the capacity for such images of the auditory sort has very much more to do with musical achievement than with ability in geometry. Indeed, no one has *demonstrated* that in either case the quality of the image has anything whatever to do with the efficiency of the response.

For one who has never made the experiment it is most instructive to compare the vividness and fidelity of visual imagery with the efficiency of knowledge of form, size, shape and the like, in the case of a hundred or so individuals.

After making such experiments one will appreciate the risk of *a priori* arguments concerning the function of individual differences in imagery and the necessity of empirical discovery of the function. For instance, the result of the following experiment, which any teacher of psychology can verify without difficulty, apparently leaves no reason for belief that what we call knowledge about the visual aspects of things is to any considerable extent dependent upon our visual images of them.

The experiment consisted in testing the knowledge of the size, number, shape and position of certain absent objects possessed by some 200 college students who had rated themselves on a modification of Galton's scale for the vividness and fidelity of their visual imagery, after the study of the descriptive psychology of imagery usual in a general course in psychology.[1] These crude ratings are, of course, subject to a somewhat large variable error, but this is immaterial to the point at issue, as will be later seen.

The tests were as follows:

Think of the Broadway front of Barnard College.

1. How many stories high is it?
2. How many windows are there in the second story?
3. How many panes of glass are there in one of these windows?
4. How many urns stand on the Broadway front of Barnard College?
5. How many posts stand in front of the Broadway front of Barnard College?

Think of the 116th Street front of the Columbia Library building.

6. How many pillars are there?
7. How many windows in the space behind the pillars?

Think of Mr. T—— (whom they had seen as a lecturer to them three quarters of an hour weekly for nine weeks).

8. Does he wear a 'stand up' or a 'turned down' collar?
9. Is his hair parted on the left, in the middle or on the right?
10. How many inches wide are his shoulders?

The amount of visual experience in the case of Barnard College and the Columbia Library varied, of course, greatly, from those who daily walked by the building several times to those who claimed never to have seen it. All such causes of variability are, however, immaterial, since they are random with respect to vividness and fidelity of visual imagery. The effect of sex is also practically random for our purpose. For our purpose, then, we have simply to compare the good with the less good visualizers. If we take as one group those who on a scale of 1–10 rated themselves 8, 9, or 10, and as the other those who rated themselves 1, 2, 3, 4 or 5, we have roughly the upper and lower thirds by the ratings.

---

[1] This study was, to be exact, that represented by Chapter III. of Thorndike's 'Elements of Psychology.'

There is no demonstrable difference between the knowledge of the one group and that of the other, nor between the highest and lowest tenths by the imagery rating.

The facts may be summarized in many ways. The median or average error is the best, perhaps, in cases where the errors vary over a wide range. The percentage of cases manifesting more than a given degree of error is a useful variant of the median error. The percentage of cases manifesting *any* error, that is, more than zero error, is practically the only useful measure in cases where the errors vary only over an extremely restricted scale, as in the judgment of 'Hair parted left, middle or right?' (middle being the correct judgment) or 'How many stories in the Broadway front of Barnard College?'

Table I. gives the results of such calculations for the best and worst thirds (62 and 73, respectively, in number) as rated for vividness and fidelity of visual imagery.

TABLE I.

Test.	Superiority of good Visualizers.	Method of Calculation,	
1.	.008	Per cent. of errors over 0 Per cent. of errors over ½ Average error	weighted equally.
2.	—.234	Per cent. of errors over 4 Average error Median error	weighted equally.
3.	—.311	Per cent. of errors 2 or over Average error	weighted equally.
4.	.110	Per cent. of errors over 0 Per cent. of errors 2 or over Average error	weighted equally.
5.	.090	Per cent. of errors over 0 Per cent. of errors 3 or over Average error	weighted equally.
6.	.170	Per cent. of errors 3 or over Average error	weighted equally.
7.	.060	Average error	
8.	.090	Per cent. of errors over 0	
9.	—.328	Per cent. of errors over 0	
10.	—.130	Per cent. of errors 5 or over Average error	weighted equally.

Average — .048.
Median + .034.

The figure for the superiority of good visualizers equals (error of poor visualizers divided by error of good visualizers) — 100, or (frequency of error in poor visualizers divided by frequency of error in good visualizers) — 100.

Six of these results favor the good visualizers, but in one case only by a hair's breadth. The four in favor of the poor visualizers are so by larger amounts, so that the average of the ten is in their favor (95). Since the average is 95 and the median 103, the most probably true central tendency is 99. The reliability of this 99, as a measure of the ratio which would be obtained from an infinite number of the same sort of tests upon these 140 individuals, is approximately P.E. = ± 4.6. There is only one chance in fourteen, for instance, that such true result will be 109 or over.

This result will seem strange or even preposterous to those who are accustomed to think of the mind's judgments as chiefly interpretations of data stored up in the form of images corresponding feature by feature with the objects and events experienced,—interpretations whose correctness depends chiefly on the data thus stored. The fact is, however, that the mind's judgments are responses to direct experiences or to any situation whatever which stands in their stead or 'means' them,—responses whose correctness depends chiefly on (1) the data experienced, (2) the permanence of the neural alterations (of whatever sort) made thereby, and (3) the degree to which satisfaction and discomfort are associated respectively with truth and error and operate as selective agencies. Moreover, it is also the fact that images corresponding feature by feature with an object or event may be extremely vivid and faithful and yet give rise to very little useful knowledge. A person may give the best of evidence that he has a distinct mental image of a certain person comparable to a photograph and yet be unable to count the buttons on the coat which he sees or estimate the width of the shoulders within ten inches!

Neither of these facts seems in the least strange to one who understands that to have connections we must make them and reward them, and that an image, no matter how exactly it corresponds to an experience in structure, may not correspond at all well dynamically, that is, in respect to the connections made with it.

In order not to prolong what is meant to be a note on an instructive class experiment into a discussion of the function of imagery, I shall omit further comments on the theoretic significance of such experiments and all comment on their practical consequences for education in science, drawing, music and the like. Suffice it to say that they add one more system of evidence of the general fact that the intellect is not a logician working over data turned out by a copying machine.

EDWARD L. THORNDIKE.

TEACHERS COLLEGE, COLUMBIA UNIVERSITY.